

SCOPE OF WORK

Model Certification of the Global Grain Forecasting Model

1. PURPOSE.

The purpose of this scope of work is to describe the work required to complete a model certification review plan and a model certification review report for the Global Grain Forecasting Model (GGFM). This work shall be completed in two phases. The first phase will result in completion of a certification review plan and cost estimate for completing a model certification review report. The second phase shall result in completion of a model certification review report that recommends to the Planning Center of Expertise for Inland Navigation (PCXIN) and Headquarters (CECW-P) whether or not the GGFM should be certified.

2. REFERENCES AND GUIDANCE

Guidance on the review process is contained in EC 1105-2-407 (31 May 2005), in the “Protocols for Certification of Planning Models under the Planning Models Improvement Program (PMIP)”, dated 6 October 2005 and in interim guidance on the certification process provided by e-mail from CECW-P on 7 September 2006 (see Attachment 1). In addition, the reviewer will reference the certification reports for the Ecosystem Response Model (ERM), the Beach-fx Model and the Great Lakes Level Analysis of Port Operation and Maintenance Model, as well as the document entitled “Center Hill Simulation Model Documentation for Certification” in order to gauge expectations for a certification report.

3. BACKGROUND

a. Model Description. The Global Grain Forecasting Model (GGFM) is a large scale, nonlinear programming model that has the objective of minimizing costs of world grain trade, subject to meeting the demands at importing countries and regions, and to the available supplies and production potential in each of the exporting countries and regions. The data used in this modeling system is largely taken from publicly available economic, demographic and agricultural data sets, or from independent analyses of these data. Similarly, publicly available nonlinear programming software (GAMS was used by the developer) is the core of the analytical computing capability of the GGFM. Under the definitions presented in EC 1105-2-407 and expanded upon in the *Protocols for Certification of Planning Models under the Planning Models Improvement Program* (PMIP), the Global Grain Forecasting Model is a corporate model with national applicability, though its use to-date has been focused upon the Mississippi and Illinois River basins. The model is also a category 1 model defined in EC 1105-2-407 as a highly-complex model used in decision making where there could be a high risk of making an incorrect investment decision that could result in major negative impacts. For

these reasons, the GGFM is, first of all, subject to certification as specified in EC 1105-2-407 and it warrants the highest level of certification review.

b. Independent Peer Review. The GGFM was developed under the Navigation Economic Technologies (NETS) program. NETS is managed by the Corps' Institute for Water Resources (IWR) and seeks to enhance and improve the Corps' modeling capabilities. The NETS mission is to develop models serving a need identified by the field, guaranteeing that any model developed is data driven, reliable, transparent, portable, usable and peer reviewed.

Independent peer review as implemented by the NETS program satisfies, in part, the spirit and intent of the Model Certification requirements described in EC 1105-2-407, "Planning Models Improvement Program: Model Certification", dated 31 May 2005. NETS' model documentation is required to describe the theoretical underpinnings of the model and how the model seeks to replicate the theoretical concept. Devices such as user manuals and/or user friendly interfaces are anticipated in order to satisfy requirements that the model be transportable and usable. This Independent Peer Review can have a number of facets. More complex modeling involves reviews of theoretical papers submitted for publication and presentation before academics at conferences. In addition, models in whole or part are reviewed for accuracy of calculations and internal wiring to include programs, subroutines, macros and/or spreadsheet cells.

c. NETS and the NESP. The Upper Mississippi-Illinois Waterway's (UMR-IWW) Navigation and Ecosystem Restoration Program (NESP) is the current user of the GGFM. The Assistant Secretary of the Army (ASA) for Civil Works directed the Corps to use the most current data and models available, with the clear expectation that these would be newly completed NETS tools (the Global Grain Forecasting Model, the Survey Model and the Shipper Response Model) in a re-evaluation of the navigation improvement plan recommended in the UMR-IWW feasibility study completed in 2005. This re-evaluation is to be presented to the ASA in September 2007.

4. INFORMATION PROVIDED BY PROPONENT

The NETS program director is the proponent for the Global Grain Forecasting Model. The proponent will provide a demonstration of the model, model documentation, and all material developed as part of independent technical/peer review(s), to include any verification tests of the nonlinear programming solver routines. Additionally, in accordance with the protocols for existing models, "the proponent (the individual or entity requesting certification) will provide to the PCX documentation to address the items outlined in Table 2". (Attachment 2) This information may be derived from independent technical/peer review or from knowledge of the models. This information should be provided in such a form that the responses to the line items are clearly associated with the appropriate line items with reasoning as to how this information addresses the issue. Each of the issues should be addressed at length. These are considered to be the minimal requirements for certification review and additional

data/information may be needed during the course of actual certification review. Addressing these issues assures that models are reviewed for certification on a consistent and comparable basis.

In addition to the primary documentation available on the NETS website (*Longer-term Forecasting of Commodity Flows on the Mississippi River: Application to Grains and World Trade* (IWR Report 06-NETS-R-12), the reviewer has been provided two other documents to date. They are: *Technical Review of Draft Report, Longer-Term Forecasting of Commodity Flows on the Mississippi River: Application to Grains and World Trade*, Independent Review Report compiled by CDM under contract to USACE, Institute for Water Resources, December 2005. *Response to Independent Technical Review*, June 1, 2007.

The reviewer(s) also have the Peer Review comments developed as part of the Upper Mississippi-Illinois Waterway Interim Report.

5. TYPE OF REVIEW

The review to be conducted as a part of the current effort will be a certification review and not a technical review. The review will be more akin to quality assurance than quality control. This review will rely on materials from previously-conducted independent technical/peer reviews and other information supplied by the proponent. Timely completion of this certification review will be contingent upon timely receipt of the materials specified in Paragraph 4. It is anticipated at this time that the review team will be comprised of an economist and a software programmer/database specialist. The proponent shall contract with the software programmer/database specialist to perform review pertaining to the functionality of software and linkage to database tables. If it is determined that a technical review of this nature has been conducted and documented, the software/database specialist may not be required. The lead reviewer is the economist on the team.

6. DESCRIPTION OF TASKS

The model certification shall be accomplished in two phases. The first phase shall include a review of Corps guidance, the Beach-fx and EMR certification reports, and the material developed through the independent peer review process of the GGFM. At the conclusion of this phase, a model certification review plan and cost estimate shall be delivered to the PCXIN. The second phase shall conclude with the preparation of the model certification review report and submittal of same to the PCXIN.

Phase 1:

TASK 1. Review Corps Guidance. The reviewer shall review and become familiar with Corps guidance and support material pertinent to model certification.

TASK 2. Review NETS Independent Peer Review Material. The reviewer shall catalogue and review material developed as part of the NETS peer review of the GGFM.

The reviewer shall make an initial determination of sufficiency, highlighting additional information that shall be required.

TASK 3. Prepare Model Certification Plan and Cost Estimate. The reviewer shall prepare a model certification plan and cost estimate. These shall be presented to the PCXIN. The PCXIN shall forward this plan to the proponent and the study team - and to CECW-P for approval.

TASK 4. Finalize Model Certification Plan. The reviewer shall be responsible for modifications to the plan as required by the PCXIN or by CECW-P. The final composition of the team shall be concluded.

Phase 2:

TASK 5. Initial Assessment Based on Independent Technical/Peer Review and Proponent-Supplied Material. The reviewer(s) will thoroughly review all independent technical review, peer review and proponent-supplied material and provide a written initial assessment relative to recommendation. The reviewer(s) will participate in a model demonstration provided by the proponent. At the conclusion of this review and the demonstration, the reviewer(s) shall provide the proponent/study team with an initial assessment relative to the adequacy and sufficiency of the information provided relative to the protocols and the prospects for certification. The proponent/study team shall provide the required material (see Attachment 2) or rationale for its exclusion.

TASK 6. Comment/Response Package. The written exchange described in Task 5 shall be followed by a telecon briefing to representatives of the PCXIN, NETS and the Interim Report study team. This assessment should alert the proponent and study team to deficiencies in material provided, means of addressing these deficiencies, and initial disposition regarding certification recommendation.

TASK 7. Final Review of Material. Any additional material provided by the proponent shall be reviewed.

TASK 8. Draft Model Certification Review Report. The reviewer(s) will prepare a model certification report, relying upon the protocols and reference material and completed reports for format and requirements. This report will contain an initial recommendation to the PCXIN regarding certification. The PCXIN will distribute to the proponent/study team for review.

TASK 9. Final Model Certification Review Report. The reviewer(s) will finalize the report and recommendation to the PCXIN. This report shall be submitted to CECW-P along with the comment/response package and the PCXIN's recommendation regarding certification.

TASK 10. Final Feedback. The proponent shall schedule a telecon with the model developer and the reviewer to exchange views and identify areas of improvement and future emphasis.

7. SCHEDULE OF DELIVERABLES

Work commences with reviewers receipt of funding from NETS. The target completion date for the certification report is 31 August 2007.

			July	Aug	Sept	
Task	Description	Hours	Month 3	Month 4	Month 4	
Phase 1		14				\$ 1,680
1	Review guidance	2				\$ 240
2	Review peer review material	2				\$ 240
3	Prepare certification plan	2	draft plan			\$ 240
4	Final certification plan	8	final plan			\$ 960
Phase 2		116				\$ 13,920
5	Initial assessment	24	briefing			\$ 2,880
6	Comment/Proponent Material	32	documentation			\$ 3,840
7	Final review of material	16				\$ 1,920
8	Draft certification report	24	draft report			\$ 2,880
9	Final certification report	16	final report			\$ 1,920
10	Final feedback	4				\$ 480
Labor subtotal		130				\$ 15,600
Travel subtotal						\$ 2,500
TOTAL						\$ 18,100

8. COST ESTIMATE

The model certification work, as outlined, would entail approximately 9 weeks (130 hours) of work. The labor cost is \$15,600 and travel is \$2,500. The cost estimate for software/database assistance is not included in this cost estimate. This work will be negotiated outside of the cost estimate presented here; however, the same schedule applies.

ATTACHMENT 1
Interim Model Certification Process
Email from Deputy, Planning Community of Practice
Leader, Flood Damage Reduction Business Line
Directorate of Civil Works

-----Original Message-----

Sent: Thu Sep 07 07:18:20 2006

Subject: Interim Guidance for PCX's to Proceed with Model Certification

Folks,

Here's some much anticipated guidance on proceeding with Model Certifications in the absence of our formal PMP.

Although it has been slower than we had hoped, we have finally made substantial headway this FY in our efforts to start certifying planning models, per EC 1105-2-407. The draft protocols for certification (attached, also see Groove site) provide a solid basis for conducting and documenting our certification process. We currently have two pilot certifications underway (as Levels 1 or 2), under a contract being directed by IWR. And we have also received an excellent prototype certification package (as Level 3) prepared by the Nashville District and the Flood Damage PCX for a regional simulation model (attached, also see Groove site).

Recognizing that there is a substantial backlog of demand for certifying models, we now feel confident that we can move forward with the PCX's to begin model certifications under interim conditions described herein. Ultimately we will still need to develop a PMP among the PCX's to fully implement our certification process, but these interim procedures will allow us to make progress in certification while we learn by doing. This will help us to define a process that works well for the Planning CoP and can eventually be captured in the certification PMP.

The interim process will largely follow the process in the EC and the draft protocols, but will have a few more check points with HQ. As you will recall, EC 1105-2-407 identifies seven steps in the Certification process: <http://www.usace.army.mil/publications/eng-circulars/ec1105-2-407/entire.pdf>

By necessity, each Certification action will require a customized certification plan akin to a PMP, both for billing purposes and for delineation of the scope of review. The certification plan should fulfill Steps 1-4 from the EC (and by following the draft protocols), as well as provide a cost estimate to the proponent. Under interim conditions, the PCX will submit each certification plan to CECW-P for approval prior to initiating the review.

Upon receiving direction to proceed from CECW-P, the PCX will implement the review process as described in Steps 5-6 from the EC. Under

interim conditions, in Step 7 the PCX will submit its recommendation for certification to CECW-P, but the determination of certification will be made by HQ.

Finally, under interim conditions an AAR in MG Riley's four-question format (attached) will be completed after each certification process so we can capture our lessons learned and share them among the full PCX team.

Action: Please submit a list of known model certification requests to Margaret Johanning (and post to the groove work space) prior to the PCX phone conference scheduled for 27 September. (We received a similar list about a year ago, so you can start by updating that list). For the call on the 27th, be prepared to discuss the potential for your PCX proceeding with any/all of these certification requests, as well as to discuss questions or comments you may have regarding these interim procedures.

Deputy, Planning Community of Practice
Leader, Flood Damage Reduction Business Line
Directorate of Civil Works

ATTACHMENT 2

Outline for Model Documentation			
Cover Sheet			
	a.	Model Name	
	b.	Functional Area	
	c.	Model Proponent	
	d.	Model Developer	
1. Background			
	a.	Purpose of Model	
	b.	Model Description and Depiction	
	c.	Contribution to Planning Effort	
	d.	Description of Input Data	
	e.	Description of Output Data	
	f.	Statement on the capabilities and limitations of the model	
	g.	Description of model development process including documentation on testing conducted (Alpha and Beta tests)	
2. Technical Quality			
	a.	Theory	
	b.	Description of system being represented by the model	
	c.	Analytical requirements and assumptions	
	d.	Conformance with Corps policies and procedures	
	e.	Identification of formulas used in the model and proof that the computations are appropriate and done correctly	
3. System Quality			
	a.	Description and rationale for selection of supporting software tool/programming language and hardware platform	
	b.	Proof that the programming was done correctly	
	c.	Description of process used to test and validate model	
	d.	Discussion of the ability to import data into other software analysis tools (interoperability issue)	
4. Usability			
	a.	Availability of input data necessary to support the model	
	b.	Formatting of output in an understandable manner	
	c.	Usefulness of results to support project analysis.	
	d.	Ability to export results into project	

		management documentation	
	e.	Training availability	
	f.	Users documentation availability and whether it is user friendly and complete	
	g.	Technical support availability	
	h.	Software/hardware platform availability to all or most users	
	i.	Accessibility of the model.	
	j.	Transparency of model and how it allows for easy verification of calculations and outputs	
	k.	Accessibility (where is model physically located?)	